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## Observations of Saturn's Rings with the Cassini-VIMS instrument.

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Immediately following its entry into orbit around Saturn on 1 July 2004, the Cassini spacecraft executed a high resolution radial scan across the dark side of the rings. The Visual and Infrared Mapping Spectrometer (VIMS) obtained a continuous series of near-infrared spectra ($\lambda = 0.9 - 5.1$ $\mu$m) of the rings at an unprecedented resolution of 15–20 km per pixel. Subsequent lower-resolution observations have shown both the sunlit and dark sides of the rings, in back-scattering and forward-scattering geometries. Each of the classical A, B and C rings is dominated by water ice, with prominent absorption bands at 1.55, 2.0 and 3.0 $\mu$m, as well as weaker bands at 1.04 and 1.25 $\mu$m. The strength of these ice bands, however, is found to vary significantly, being strongest in the middle A ring and weakest in the C ring and Cassini Division. These variations probably represent differences in grain size on the surface of the meter-sized ring particles, rather than compositional differences. The transitions between the C and B rings and between the Cassini Division and A ring are marked by gradual changes in band depth over radial distances of a few thousand km, indicative of ballistic or collisional redistribution of material. In addition to water ice, VIMS spectra of the C ring and the Cassini Division show a broad, shallow absorption in the $0.9 - 1.8$ $\mu$m region which we tentatively attribute to ferrous minerals, most likely silicates originating from the infall of interplanetary dust over the past 100 Myr or so. Local variations in ice band strengths are also seen, primarily associated with strong density waves driven in the A ring at resonances with the satellites Mimas and Janus and perhaps reflecting an enhanced collisional regime as the waves are damped. At certain longitudes and lighting geometries, absorption features attributable to organic material appear in the rings' spectrum. Although a definitive explanation is still pending, the available evidence suggests that these features are due to reflected Saturnshine, which carries a strong imprint of methane absorption.

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